

**PATENT**

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**ABSTRACT OF THE DISCLOSURE**

Methods are provided for forming optical devices, such as waveguides, with minimal defect formation. In one aspect, the invention provides a method for forming a waveguide structure on a substrate surface including forming a cladding layer on the substrate surface, forming a core layer on the cladding layer, depositing an amorphous carbon hardmask on the core layer, forming a patterned photoresist layer on the amorphous carbon hardmask, etching the amorphous carbon hardmask, and etching the core material.

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